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Task Analysis in National Health Service Corps Field Stations: A Methodological Evaluation

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An occupational survey using a task inventory as survey instrument was conducted at four National Health Service Corps clinics providing primary ambulatory care. The prime objective of the study was to determine whether the methodology of task analysis could validly be applied to obtain data of potential value in improving personnel management in clinics. It is concluded that the task inventory could generate such data.

A first level analysis provides some interpretations of task interrelationships and role definition among clinic staff. In the clinics studied, no staff member's role was sufficiently well defined for efficient utilization of his capabilities. In particular, many tasks performed by the physicians and nurses could also be performed by less well-trained personnel. A number of steps are suggested for examining the task profiles of clinic staff and identifying areas of potential task redistribution.

Also discussed are ways of improving the presentation of data obtained through task analysis to enhance the data's usefulness to local clinic management.

IT IS WELL acknowledged that the American health system is under severe stress. The cost of providing necessary services is high and rising steeply. A significant segment of the population lacks services at any cost. Various new strategies are being developed and tested to relieve this stress by improving the efficiency and effectiveness of the health care now being delivered. The need for such attention to productivity in National Health Service Corps (NHSC) practices is more essential than in the general population because: 1) a minimum number of practitioners is being placed in a given population; 2) the communities have been underserved in the past and have a backlog of unmet needs; and 3) the financial resources of both the communities and the NHSC are limited. This being the case, it was decided to conduct a pilot task analysis in a small sample of NHSC sites to determine if the methodology would be useful in obtaining information pertinent to practice management.

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Task analysis of health professionals has been done in a number of settings. The present approach attempts to define the specific tasks that a worker does during a standard period of time. It includes an analysis of how often each task is performed and how much time is spent on it. More refined task analysis can also deal with the issues of task delegation.

It was hypothesized that the task profiles of NHSC practitioners may not be ideally balanced for most efficient utilization. The purpose of this pilot study was to determine whether task analysis methodology would reveal such dysfunction and present it in such a manner that changes could be made in the local practice, leading to more efficiency and thereby allowing a better quantity or quality of care. Most efficient utilization of personnel may be defined as the result of an organization's providing career development and utilizing its personnel to their highest level of training. It was predicted that significant task maldistribution could lead the local practice to change the situation in one of the following ways: redistributing tasks within the same staff complement, adding another staff person of the professional type indicated by the deficiencies in the analysis, or providing additional training to one or more staff members in the areas of task maldistribution.

Design of Study

A number of NHSC field stations were selected for participation in this initial pilot study. NHSC central staff and the Problem Oriented Management Institute of Family Health Care, Inc.* reviewed the operational NHSC clinics for two main factors: each clinic should have a variety of professional personnel, and the patient volume should approximate saturation. The initial number of clinics selected was reduced to four after coordination with the NHSC Regional Program Director. The clinic staffs were contacted by telephone to ascertain their willingness to participate in the study. Each participant was assured that his individual data and clinic data would be treated anonymously and would not be used for purposes of evaluation of performance. The four clinics included one urban clinic in the Southwest and three clinics in rural communities (two in the Great Plains and one in the Southeast).

The instrument used for data collection was the task inventory. Task inventories were developed and used extensively by the Air Force and Navy Personnel Research Laboratories in their studies of manpower utilization and development of training programs.[1, 2] Although originally used to study occupations which involved only psychomotor skills, the task inventory has since been applied successfully to study occupations requiring cognitive and communicative skills.[3, 4] The task inventory used in this study consists of 650 tasks performed in primary care settings, including major clinical procedures, major and minor nursing tasks, laboratory and x-ray procedures, patient counseling and health education, and secretarial-administrative duties. The tasks were organized in a booklet according to major functional areas to aid in recall. A sample page from the inventory is given in Table 1. The inventory also contained a section to elicit general biographical information from the incumbent.

The same inventory was administered to all participants in the study. The task inventory used in this study had been applied successfully in a previous study of staffing patterns and manpower utilization in multispecialty clinics.[4] During the previous study, the validity of the task inventory was confirmed by several means. For each task in the inventory, the incumbents were asked to report their frequency

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*This organization has provided field management assistance to NHSC clinics.

Table 1. *Sample Inventory Page*

Examination Procedures	Frequency*	Time Consumed†	
Perform General Physical Examination on Child	0 1 2 3 4 5	1 2 3 4 5 6 7	130665
Perform Developmental Screening Examination of children, *e.g.*, Denver Developmental	0 1 2 3 4 5	1 2 3 4 5 6 7	130113
Examine Skin for Texture, Color, Abnormalities	0 1 2 3 4 5	1 2 3 4 5 6 7	130707
Examine Gums and Teeth, *e.g.*, for Gingivitis or Caries	0 1 2 3 4 5	1 2 3 4 5 6 7	130683
Test Reflexes	0 1 2 3 4 5	1 2 3 4 5 6 7	130685
Perform Neurological Examination	0 1 2 3 4 5	1 2 3 4 5 6 7	130705
Examine Head	0 1 2 3 4 5	1 2 3 4 5 6 7	530670
Examine Ears With Otoscope	0 1 2 3 4 5	1 2 3 4 5 6 7	130684
Test Hearing Acuity, *e.g.*, with Watch	0 1 2 3 4 5	1 2 3 4 5 6 7	130671
Observe For Blurred or Double Vision	0 1 2 3 4 5	1 2 3 4 5 6 7	530474
Examine eyes using ophthalmoscope	0 1 2 3 4 5	1 2 3 4 5 6 7	130673
Examine eyes externally (i.e., Conjunctiva, extraocular muscles, pupillary reaction)	0 1 2 3 4 5	1 2 3 4 5 6 7	130672
Examine External Lymph Nodes	0 1 2 3 4 5	1 2 3 4 5 6 7	130658
Examine Nose, Throat, Mouth, and Pharynx	0 1 2 3 4 5	1 2 3 4 5 6 7	130704
Examine thyroid, *e.g.*, for nodules/enlargement	0 1 2 3 4 5	1 2 3 4 5 6 7	130659

* Task frequency: 0=DO not DO; 1=DO, but not last month; 2=DO monthly; 3=DO Weekly; 4=DO daily; 5=DO repeatedly daily.

† Your time consumed, last time performed; 1=1 minute or less; 2=2 to 3 minutes; 3=4 to 5 minutes; 4=6 to 10 minutes; 5=11 to 20 minutes; 6=21 to 30 minutes; 7=over 30 minutes.

of performance and the duration of their last performance. The total time each incumbent spent to perform all tasks, obtained by summing the products of the frequency and duration given for each task, was compared with the total time the incumbent reported in the biographic section of the inventory and with the total time recorded in the financial records of the clinic. The summation of the frequency times duration yielded a mean total time of nine hours per day with a standard error of 30 per cent. This result agreed with the total time obtained by the other two sources, thus establishing the correlative validity of the responses.[5]

Further, the per cent time reported worked on major functional areas, such as administration, patient care, etc., was compared with the per cent time obtained by clustering tasks into major functional areas and summing the per cent time reported spent on the various individual tasks. The hypothesis of equality of these two responses was accepted at the 95 per cent level of significance.

We are confident of the inherent validity of the results because 1) we personally visited all sites and were present to answer questions as the respondents completed the inventory; 2) during the administration of the inventory, we continually explained the meaning of tasks even if not asked, stressing subtleties like the difference between obtaining symptoms and evaluating symptoms; 3) we assured the respondents that no personal evaluation of their performance was involved — in fact, the only person onsite who knew the identity of the respondent was the clinic administrator; and 4) participation in the study was strictly voluntary. Since the concept of face value is probably not relevant for the tasks included in this inventory,[5] no attempt was made to obtain face validity coefficients.

The reliability of the instrument was established using split half correlation coefficients, obtaining a value of 0.96.[3]

During this experiment, we did not clarify whether the task inventory could be used as a mail survey instrument. At the least, we feel that detailed procedures and instructions for self-administration would have to be developed and tested before the inventory could be used as such. In implementing a larger scale study, we will probably prefer to employ trained field coordinators than to use a mail questionnaire.

When completed, the task inventory booklets were processed and edited and reports were generated which show the task frequency for each individual (Table 2) as well as the shared task relationships for all workers in a given clinic. The results were returned to the individual site and to the program directors originally involved in the study with an explanatory letter that included an initial interpretation of the results and offered help in further interpretation or follow-up regarding the results. At least two of the clinics receiving these reports indicated that they had made good use of the study results in improving the management or understanding of their clinics.

Results

The large amount of data collected by this method can be analyzed in a number of ways. Much of the analysis must be done at the local level for optimum interpretation based on specific site conditions. This analysis will deal with a few simple relationships that appear relevant to answering the primary question of this investigation, which was: Does this method have potential usefulness for management of NHSC practices?

Combined Analysis of an Entire Clinic

In order to demonstrate the usefulness of the methodology to an entire clinic, we will analyze Clinic 2 in some detail. The staff in this clinic consists of two physicians, one nurse, one licensed practical nurse, and two secretary-receptionists. The task profiles for all worker categories are computed for each task; from this data, a table is prepared that shows the total interrelationships of all worker tasks at that clinic (Table 3).

Each cell in Table 3 shows the number of tasks and per cent time spent on tasks done both by the worker identified in the horizontal row and in the vertical column but by no other worker. The horizontal row labeled "others" includes tasks that all "other" workers in the clinic share exclusively with another category of worker. The vertical column labeled "others" includes tasks that are both exclusively shared with one other worker and are also performed by more than two workers. In the total column, the numeric entry in a given cell represents the total number of tasks performed by the worker identified in the horizontal row title (1-4). The percentage entry in a given cell represents the total percentage of time spent by the worker identified in the horizontal row and should equal approximately 100 per cent. When more than one worker is in a category, their task performance is combined for the purpose of this analysis.

Although norms for task distribution in this type of practice setting have not been established, studies in other primary care clinics indicate that the most efficient pattern for physicians is in the range of 200 to 250 exclusive tasks, with approximately 75 per cent of the physician's time being spent on them.[4] The total number of tasks performed by the physicians in Clinic 2 is relatively high (435, cell 1-E). The number of tasks that they do exclusively is low

TABLE 2. *Sample Report Page*

Task ID	Task Statement	Average Frequency per Month							Average Time To Perform, in Minutes	Per Cent Total Department Time Expended	Cumulative % Department Time
		MD	RN	LPN	TECH	SEC	NA/MA	Other			
130081	Obtain preliminary medical history, *i.e.*, past/present complaints, allergies, medications	54.14	48.25	4.00	.00	29.40	.16	21.00	7.55	1.30	1.30
120122	Listen to patient/family discuss their personal problems	36.14	31.50	21.00	.00	8.40	.00	1.00	13.45	1.27	2.57
330463	Do routine filing	.00	15.75	.00	.00	54.60	33.50	.08	14.11	1.20	3.77
130656	Obtain patient's chief complaint	39.71	52.50	63.00	.00	54.60	63.00	31.50	4.95	1.10	4.88
330606	Prepare charge slips for services to patient	9.00	31.50	21.00	.00	25.60	32.00	21.00	12.91	1.09	5.97
314068	Read/review medical literature	19.71	2.00	4.00	.00	.06	.00	1.00	30.75	1.07	7.04
110056	Stand by during examination of female patients	.00	52.50	63.00	.00	.20	42.00	31.50	8.90	0.94	7.98
130682	Observe patient's general appearance and behavior	54.00	63.00	63.00	.00	16.80	42.00	1.00	4.87	0.90	8.89
330190	Type	.00	2.00	.00	.00	42.80	10.50	.08	11.55	0.89	9.79
130006	Check blood pressure	30.00	63.00	63.00	.00	.00	63.00	31.50	5.07	0.88	10.67
130084	Measure/weigh patient or personnel	.00	63.00	63.00	.00	.00	42.00	31.50	7.22	0.86	11.53
130432	Identify factors that influence patient's psychological state	21.71	36.75	.00	.00	4.20	.00	.00	12.55	0.84	12.37
130436	Evaluate patient's complaints or symptoms of pain	57.00	8.25	63.00	.00	.00	.00	.00	7.41	0.81	13.19
330617	File completed reports, prescriptions into patient's record	18.00	15.75	.00	.00	54.60	.00	5.33	7.20	0.81	14.00

TABLE 3. *Interrelationships of Tasks at Clinic 2*

			A	B	C	D	E
			MD	RN	LPN	Others	Totals
1	MD	Inc. Tasks	253	29	33	120	435
		% Time	49.87	3.43	7.49	40.27	101.06
2	RN	Inc. Tasks	29	19	40	134	222
		% Time	2.67	4.39	21.23	71.83	100.12
3	LPN	Inc. Tasks	33	40	20	121	214
		% Time	6.54	25.45	6.42	61.32	99.73
4	Others	Inc. Tasks	3	12	5	76	96
		% Time	3.13	14.70	3.78	78.58	100.19

(49.9%, cell 1-A). Are the data helpful in identifying the reason for this?

The total number of tasks done exclusively is not excessive (253, cell 1-A). These tasks done exclusively appear generally appropriate since almost all fall into the areas of symptom evaluation, evaluation of complaints, and treatment procedures. Certain of these tasks, but not a great number of them (*e.g.*, take vaginal smear, insert Levine tube, give emergency first aid for insect bite) are potentially performed by other workers in the clinic if properly trained. The number of tasks shared with the nurse and LPN is small, taking a small per cent of the physicians' time. The implications of this will be discussed below. A large percentage of the physicians' time, however, is being spent on tasks that other workers in the clinic also do (40.3%, 120 tasks, cell 1-D). Of those 120 tasks, only three tasks (cell 4-A) are shared exclusively by the physicians and "other" workers. The remaining 117 tasks are shared by the physician, the other workers, and either the nurses and LPNs or both. The cluster analysis of those tasks is described in Table 4.

The largest percentage of such shared tasks is in the area of Evaluation of Patient Complaints and Response. Each physician spends 16 per cent of his time on tasks in this category that two or more other workers in that clinic also do. Most of these are tasks that are traditionally performed by physicians exclusively, such as "evaluate symptoms of patient complaining of chest pain" and "evaluate symptoms of patient complaining of nausea, vomiting, and diarrhea." Interestingly, the nurse only spends 4.98 per cent of her time on shared tasks in this cluster whereas the LPN spends 17.2 per cent. The performance of these tasks should be carefully investigated in this clinic. Any worker performing them should be specifically trained in the proper performance of symptom evaluation for the tasks shared. If this can be done, significant amounts of physician time can be reallocated to tasks that only he can and should do, and other workers can be freed to perform tasks that they perform most effectively.

In the history-taking cluster, one physician is spending almost 9 per cent of his time at tasks such as "obtaining a social and family history," "obtaining a system review," "obtaining an immunization history," and "obtaining a prenatal history." These are tasks that clearly could be performed by someone else in the clinic. Indeed, it appears that someone else is doing them for the other physician in the same clinic, who spends only 1.8 per cent of his time on these shared history-taking tasks.

TABLE 4. *Per Cent of Total Time Spent by Physicians in Tasks Shared by Physicians and Two or More Clinic Employees*

Cluster Number	Cluster Title	M.D.$_1$	M.D.$_2$
01	History taking	1.82	8.97
02	Examination procedures	1.61	3.29
04	Laboratory test procedures, and specimen collection	0.02	0.00
07	Coordination of medical care, patient assistance, and preparation	1.22	2.14
09	Patient instruction	4.04	1.12
10	Emergency treatment procedures	0.34	0.11
11	Patient counseling (miscellaneous treatment regimes)	1.02	0.92
13	Patient counseling (G-I and G-U)	0.11	0.29
14	Patient counseling (cardiovascular and respiratory)	1.42	0.74
15	Symptom evaluation (neuro-psych)	4.97	3.28
16	Evaluation of patient complaints and response	15.68	16.27
17	Treatment procedures (miscellaneous)	2.68	0.91
19	Treatment procedures (G-I and G-U)	0.04	0.06
21	Operating room procedures	0.01	0.00
22	Pre-postoperative instructions	0.02	0.00
24	Physical therapy/occupational therapy instructions and treatment	0.09	0.00
26	Treatment planning, follow-up	2.70	0.23
28	Teaching, research, personnel	1.79	1.12
29	Miscellaneous clerical and secretarial tasks	0.01	0.06

The nurse in this clinic performs a total of 222 tasks (cell 2-E). The number and per cent time on exclusive tasks (19, 4.4%, cell 2-B) are extremely low. These tasks are almost all in the laboratory procedures and administrative clusters. Only 29 tasks occupying 2.7 per cent of her time are shared with physicians. This small percentage of time indicates that the nurse is not significantly engaged in clinical tasks. Forty tasks taking 21.2 per cent of the nurse's time (cell 2-C) are shared with the LPN. This does not seem excessive or unusual; the 40 tasks are almost all minor nursing functions and procedures. The significant category again appears to be the tasks shared with two or more workers (cell 2-D). The cluster analysis of these tasks indicates that they are predominantly in the areas of neuropsychiatric symptom evaluation (18%), examination procedures (6.86%), patient instruction (7.76%), history taking (5.0%) and coordination of medical care (5.23%). Certain of these tasks must be shared in any clinic, but inefficiency must result when such a great amount of time is spent in tasks shared by three or more workers.

This analysis of the nursing task performance clearly indicates that in this clinic the nurse is performing in a predominantly nonexclusive role and that the majority of her time is being spent on tasks that the LPN and other clinic personnel are doing. Very little of her time is spent on tasks that physicians are also doing. Clinic efficiency could clearly be increased if the amount of time spent on minor nursing and administrative tasks was decreased and a more exclusive role developed. Time saved in this fashion could be utilized in beginning to perform tasks now done exclusively by physicians; this should enable more patients to be seen or a higher quality of care given.

The situation is similar with the LPN category. Only 20 tasks taking 6.4 per cent of total time are exclusive (cell 3-C). An appropriate 25.4 per cent of her time is spent on the 40 tasks identified above that are shared with nurses (cell 3-B). Thirty-three tasks taking 6.5 per cent time are shared with the physician (cell 3-A); many of these appear to be more clinical than the tasks shared by the physician and nurse. Even though these shared tasks involve only a small amount of time, the question is raised whether the LPN in this clinic is performing clinical functions that are inappropriate for her training or licensure and/or has the potential for further expanded functions with additional training and delegation.

The "others" category is also important to analyze. Very few tasks are shared by the others with only one other worker exclusively. The others share more tasks with the nurse (cell 4-B) than with any other staff member, including 12 tasks that take 14.7 per cent of the others' time. These tasks are primarily in the administrative and preparation clusters. It is interesting to note that this overlap is much higher than with the others and the LPN and may confirm the impressions of the LPN noted above.

Of the 76 tasks in cell 4-D, only 22 tasks, occupying 14 per cent of the others' time, are done exclusively by this category of worker. Fifty-four tasks, taking 64 per cent of the others' time, are performed jointly with the MD, RN, or LPN in the following fashion: of the 54 tasks, 46 are also done by the MD, 50 by the RN and 40 by the LPN. The tasks that the others do exclusively fall primarily in the clusters of clerical-administrative and managerial-administrative tasks. The immediate conclusion to be drawn is that in this clinic, the role of the worker category "other" is completely undefined.

TABLE 5. *Nursing Task Analysis*

Clinic	Total Tasks	Exclusive Tasks	Per Cent Time Exclusive
1	296	76	10
2	222	19	4
3	255	8	2
4	270	66	17

Analysis of Nursing Tasks in All Clinics

The methodology also allows the comparison of task distribution of a given professional type in a large number of clinics. Table 5 shows the total and exclusive tasks done by nurses in the four NHSC clinics and the per cent of their time spent on exclusive tasks.

In general, the nursing role in the NHSC clinics is far from an exclusive one. Most of the nurse's time is spent doing tasks that others are also doing. The variance in exclusivity, although present, is less impressive than the total pattern — that no nurse is spending more than 17 per cent of her time in an exclusive role. Cluster analysis of nursing tasks reveals no consistent pattern of per cent time in each cluster among the clinics studied. With regard to exclusivity the basic question is: What is the RN doing in her nonexclusive time? She can share the tasks with the physician, in which case her role is extended, or she can share them with other workers. If she is spending time with other workers, it is likely that she is either performing tasks that others are doing and/or training or supervising the others. Analysis of task interrelationships allows an evaluation of these possibilities.

Table 6 shows the tasks that are shared by physicians and nurses in each clinic. The number of shared tasks varies significantly

TABLE 6. *Physician Nurse Task Interrelationships*

Clinic	Number Shared Tasks Performed by RN	Per Cent RN Time Spent on Shared Tasks	Per Cent MD Time Spent on Shared Tasks
1	68	9	30
2	29	3	3
3	154	59	36
4	153	38	29

from 29 in Clinic 2 to 154 in Clinic 3. The interpretation of time spent on shared tasks is complex but revealing. In Clinic 2, the number of shared tasks is low (29), and only 3 per cent of each person's time is spent on shared tasks. This might indicate a highly exclusive task performance pattern, but the exclusive patterns in that clinic show that the physicians spend only 49 per cent of their time on exclusive tasks, and the nurses 4 per cent. Thus, a significant amount of time is being spent on tasks shared with other workers; this has been analyzed in more depth in the preceding section. An exploration of the tasks shared by the nurses and physicians in Clinics 1 and 2 as opposed to the clearly different situation in Clinics 3 and 4 should be illustrative of the widely different roles performed by NHSC nurses.

Discussion

The purpose of this pilot study was to determine if the methodology of task analysis would be useful to NHSC field clinics or NHSC regional and central management in making the clinic more efficient and effective in delivering patient care. The analytical problem concerns reducing a massive amount of small bits of data into statements and relationships that are valid and that can be easily understood and acted on by a concerned health professional or administrator.

The first level analysis presented here provides valid interpretations in this regard. In Clinic 2, a number of steps are suggested. Physician 2 should look at the large amount of time being spent on history taking and see if others could do it more efficiently. Both physicians should look at some of the tasks in symptom evaluation that others are doing and see if these individuals can be trained to assume a more exclusive role in these categories. The nonexclusive roles of the nurse, the LPN, and the other workers must be examined and shared tasks redistributed to some degree. The reasons and appropriateness for the LPN to be sharing a relatively large number of clinical tasks with the physicians and relatively few with the nurse should be explored. As the clinic staff examines the specific tasks, the obvious and most natural areas of redistribution should be apparent and should aid them in the process.

The ultimate evaluation of the methodology is the usefulness of the data and results in producing changes in the local clinics. Administrative constraints have not permitted a careful local evaluation and follow-up of the usefulness of the data although two clinics spontaneously reported its validity and potential assistance.

The presentation of data on simply what exists in a current situation is limiting with regard to conclusions for how a local situation should change to a more efficient pattern. In future studies, local professionals and outside experts should make judgments regarding which tasks are appropriately exclusive for a given category of worker and which are appropriately shared to a significant extent. The results can then be presented such that the tasks or clusters of tasks that are judged to be inappropriate for the worker, but on which he is currently spending a significant amount of time, can be identified in rank order. This type of presentation would simplify the mass of data into an immediately usable form at the local level without requiring further time-consuming local analysis.

Finally, the addition of financial data on costs of different categories of health professionals and on tasks for which reimbursement is possible could provide a sophisticated cost-effectiveness analysis for task allocation.

Summary

The methodology of task analysis was applied to four NHSC clinics to determine its potential usefulness for local and central management purposes. This methodology was found to be applicable for monitoring personnel utilization at the clinic level. The results allow for the identification of specific areas of potential task redistribution in a clinic for more efficient operations by constructing more exclusive worker task profiles. Suggestions are discussed for presenting the data in more useful ways to local clinic management.

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